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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/669,384	09/24/2003	Cem Basceri	150.01170103	3937

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EXAMINER	
ARENA, ANDREW OWENS	
ART UNIT	PAPER NUMBER
2811	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	12/19/2006	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/669,384	BASCERI ET AL.	
	Examiner	Art Unit	
	Andrew O. Arena	2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 September 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *67-114* is/are pending in the application.

4a) Of the above claim(s) *96-114* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *67-74,76-86 and 88-94* is/are rejected.

7)☒ Claim(s) *75,87 and 95* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *Sep 29 2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Claims 96-114 stand withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on 10/18/2005.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 67-69, 71-74, 78, 80, 83-86 & 88-90 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kingon (US 5,555,486) in view of Yoon (E.S.S. Lett. V.3 No.8) & Al-Shareef (US 6,281,543).

Re claim 67, Kingon discloses (Fig 6) a method for use in the fabrication of integrated circuits (col 8 ln 20-24) comprising:

providing a substrate assembly (21; col 7 ln 24) comprising a surface, wherein the surface comprises oxygen (col 7 ln 25-26);

forming a first metal (Pt) layer (29; col 7 ln 36;) on at least a portion of the surface;

forming a second metal (Ru) layer (30_1; col 7 ln 31-32) on at least a portion of the first metal layer;

forming an oxidation diffusion barrier layer (31_1; gold: col 7 ln 33-34) on at least a portion of the second metal layer; and

causing oxygen to diffuse into the first metal layer by annealing (said diffusion must occur to some extent during the anneal: col 9 ln 6-7).

Kingon differs from the claimed invention only in not expressly disclosing "causing oxygen to diffuse through...to oxidize...the second metal layer".

Yoon discloses a high-K capacitor bottom electrode formed of Pt having grain boundaries stuffed with RuO_2 to prevent diffusion (abstract). Yoon teaches this electrode structure provides the advantages of both Pt and RuO_2.

Al-Shareef teaches that oxygen diffuses though Pt (col 2 ln 58-59) and teaches annealing to cause oxygen to diffuse through a Pt layer to oxidize (into RuO_2) one or more regions of an Ru layer (col 5 ln 35-45, col 6 ln 16-29).

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to perform the anneal step so as to cause oxygen to diffuse through the first metal layer to oxidize one or more regions of the second metal layer; at least to prevent diffusion through the Pt layer.

Re claim 68, Kingon discloses thermally treating (col 9 ln 6-7) the substrate assembly having the first metal layer, second metal layer, and oxidation diffusion barrier layer formed thereon.

Re claim 69, Kingon discloses annealing the substrate assembly having the first metal layer, second metal layer, and oxidation diffusion barrier layer formed thereon at a temperature greater than 300°C (col 9 ln 6-7).

Re claims 71 & 72, Kingon discloses (Fig 6) the first metal layer (29) comprises platinum (col 7 ln 36).

Re claims 73 & 74, Kingon discloses (Fig 6) the second metal layer (30_1) comprises ruthenium (col 7 ln 32).

Re claim 78, Kingon discloses (Fig 6) a method for use in the fabrication of integrated circuits (col 8 ln 20-24) comprising:

providing a substrate assembly (21; col 7 ln 24) comprising a surface, wherein the surface comprises oxygen (col 7 ln 25-26);

forming a first metal (Pt) layer (29; col 7 ln 36) on at least a portion of the surface, the first metal layer comprising one or more grain boundaries (unless a special process is carried out to form single-crystal platinum, the platinum layer is polycrystalline, and inherently comprises one or more grain boundaries);

forming a second metal (Ru) layer (30_1; col 7 ln 31-32) on at least a portion of the first metal layer; and

diffusion of oxygen into one or more grain boundaries of the first metal layer by annealing (said diffusion must occur to some extent during the anneal: col 9 ln 6-7).

Kingon differs from the claimed invention only in not expressly disclosing "forming metal oxide regions...by diffusion of oxygen through...the first metal layer".

Yoon discloses a high-K capacitor bottom electrode formed of Pt having grain boundaries stuffed with RuO_2 to prevent diffusion (abstract). Yoon teaches this electrode structure provides the advantages of both Pt and RuO_2.

Al-Shareef teaches that oxygen diffuses though Pt (col 2 ln 58-59) and teaches annealing to cause oxygen to diffuse through a Pt layer to oxidize (into RuO_2) one or more regions of an Ru layer (col 5 ln 35-45, col 6 ln 16-29).

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to perform the anneal step so as to form metal oxide regions on at least portions of the first metal layer through oxidation of at least portions of the second metal layer by diffusion of oxygen through one or more grain boundaries of the first metal layer; at least to prevent diffusion through the Pt layer.

Re claim 80, Kingon discloses thermally treating (col 9 ln 6-7) the substrate assembly having the first metal layer, second metal layer, and oxidation diffusion barrier layer formed thereon wherein thermally treating comprises annealing the substrate assembly having the first metal layer, second metal layer, and oxidation diffusion barrier layer formed thereon at a temperature greater than 300°C (col 9 ln 6-7).

Re claims 83 & 84, Kingon discloses (Fig 6) the first metal layer (29) comprises platinum (col 7 ln 36).

Re claims 85 & 86, Kingon discloses (Fig 6) the second metal layer (30_1) comprises ruthenium (col 7 ln 32).

Re claim 88, Kingon discloses (Fig 6) a method for use in the fabrication of integrated circuits (col 8 ln 20-24) comprising:

providing a substrate assembly (21; col 7 ln 24) comprising a surface, wherein the surface comprises oxygen (col 7 ln 25-26);

forming a platinum layer (29; col 7 ln 36) on at least a portion of the surface;

forming a ruthenium layer (30_1; col 7 ln 31-32) on at least a portion of the platinum layer; and

diffusion of oxygen into the platinum layer by annealing (said diffusion must occur to some extent during the anneal: col 9 ln 6-7).

Kingon differs from the claimed invention only in not expressly disclosing "forming ruthenium oxide regions...by diffusion of oxygen through the platinum layer".

Yoon discloses a high-K capacitor bottom electrode formed of Pt having grain boundaries stuffed with RuO_2 to prevent diffusion (abstract). Yoon teaches this electrode structure provides the advantages of both Pt and RuO_2.

Al-Shareef teaches that oxygen diffuses though Pt (col 2 ln 58-59) and teaches annealing to cause oxygen to diffuse through a Pt layer to oxidize (into RuO_2) one or more regions of an Ru layer (col 5 ln 35-45, col 6 ln 16-29).

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to perform the anneal step so as to form ruthenium oxide regions on at least portions of the platinum layer through selective oxidation of the ruthenium layer by diffusion of oxygen through the platinum layer; at least to prevent diffusion through the Pt layer.

Re claim 89, Kingon as modified above discloses (Fig 6) forming ruthenium oxide regions on at least portions of the platinum layer through selective oxidation of the ruthenium layer comprises:

providing an oxidation diffusion barrier layer (31_1; gold: col 7 ln 33-34) on at least a portion of the ruthenium layer;

thermally treating (col 9 ln 6-7) the substrate assembly having the platinum layer, ruthenium layer, and oxidation diffusion barrier layer formed thereon to selectively oxidize one or more regions of the ruthenium layer by diffusion of oxygen through one or more grain boundaries of the platinum layer.

Re claim 90, Kingon discloses thermally treating (col 9 ln 6-7) the substrate assembly having the platinum layer, ruthenium layer, and oxidation diffusion barrier layer formed thereon wherein thermally treating comprises annealing the substrate assembly having the platinum layer, ruthenium layer, and oxidation diffusion barrier layer formed thereon at a temperature greater than 300°C (col 9 ln 6-7).

Claims 70, 76, 77, 79, 81, 82 & 91-94 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kingon, Yoon, and Al-Shareef as applied to claims 67, 78 & 89 above, and further in view of Basceri (US 6,482,736).

Re claims 70, 81 & 91, Kingon as modified above differs from the claimed invention only in not disclosing annealing in a non-oxidizing atmosphere.

Kingon as modified above teaches the SiO_2 layer on the substrate (Kingon: col 7 ln 25) as the source of oxygen for oxidizing the second metal (Ru) layer.

Basceri teaches annealing in a non-oxidizing atmosphere (col 4 ln 12-16).

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to further modify Kingon such that said annealing comprises annealing the substrate assembly having the first metal (Pt) layer, second metal (Ru) layer, and oxidation diffusion barrier (Au) layer formed thereon in a non-oxidizing atmosphere; at least to prevent oxidation of unintended portions of the device.

Re claims 76 & 77, Kingon as modified above differs from the claimed invention only in not disclosing the claimed removal.

Kingon discloses that any number of the alternating layers (30, 31) may be used (col 7 ln 44-47) including that there may be none at all (Fig 1b).

Yoon teaches an RuO_2-stuffed Pt bottom electrode for a high-K capacitor.

Basceri discloses (Fig 6) an enhanced-surface-area bottom electrode (12+16; col 5 ln 15-19) for a high-K capacitor (col 5 ln 58-60) formed by annealing to oxidize regions of an Ru layer into RuO_2 (col 4 ln 8-11) and then removing the unoxidized portions using at least one of a wet etch and a dry etch (col 4 ln 30-43). Basceri also states the known desire to increase capacitance without increasing device size (col 1 ln 37-43).

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to further modify Kingon in view of Basceri to further comprise, before depositing the PZT layer, removing the oxidation diffusion barrier layer and unoxidized portions of the second metal layer (by wet or dry etch); at least to provide a capacitor of reduced size and enhanced electrode performance.

Re claims 79 & 82, Kingon as modified above discloses (Kingon):

providing an oxidation diffusion barrier layer (31_1; gold: col 7 ln 33-34) on at least a portion of the second metal layer; and

thermally treating the substrate (col 9 ln 6-7) assembly having the first metal layer, second metal layer, and oxidation diffusion barrier layer formed thereon to selectively oxidize one or more regions of the second metal layer at the one or more grain boundaries of the first metal layer resulting in the one or more metal oxide regions and unoxidized portions of file second metal layer.

Kingon as modified above differs from the claimed invention only in not disclosing the claimed removal.

Kingon discloses that any number of the alternating layers (30, 31) may be used (col 7 ln 44-47) including that there may be none at all (Fig 1b).

Yoon teaches an RuO_2-stuffed Pt bottom electrode for a high-K capacitor.

Basceri discloses (Fig 6) an enhanced-surface-area bottom electrode (12+16; col 5 ln 15-19) for a high-K capacitor (col 5 ln 58-60) formed by annealing to oxidize regions of an Ru layer into RuO_2 (col 4 ln 8-11) and then removing the unoxidized portions using at least one of a wet etch and a dry etch (col 4 ln 30-43). Basceri also states the known desire to increase capacitance without increasing device size (co 1l n 37-43).

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to further modify Kingon in view of Basceri to further comprise, before depositing the PZT layer, removing the oxidation diffusion barrier layer and unoxidized portions of the second metal layer (by wet or dry etch); at least to provide a capacitor of reduced size and enhanced electrode performance.

Re claims 92 & 93, Kingon as modified above discloses the thermal treatment results in the one or more ruthenium oxide regions and unoxidized ruthenium portions of the ruthenium layer.

Kingon as modified above differs from the claimed invention only in not disclosing the claimed removal.

Kingon discloses that any number of the alternating layers (30, 31) may be used (col 7 ln 44-47) including that there may be none at all (Fig 1b).

Yoon teaches an RuO_2-stuffed Pt bottom electrode for a high-K capacitor.

Basceri discloses (Fig 6) an enhanced-surface-area bottom electrode (12+16; col 5 ln 15-19) for a high-K capacitor (col 5 ln 58-60) formed by annealing to oxidize regions of an Ru layer into RuO_2 (col 4 ln 8-11) and then removing the unoxidized portions using at least one of a wet etch and a dry etch (col 4 ln 30-43). Basceri also states the known desire to increase capacitance without increasing device size (co 1l n 37-43).

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to further modify Kingon in view of Basceri to further comprise, before depositing the PZT layer, removing the oxidation diffusion barrier layer and unoxidized portions of the second metal layer (by wet or dry etch); at least to provide a capacitor of reduced size and enhanced electrode performance.

Re claim 94, Kingon discloses (Fig 6) forming a dielectric material (24") over at least a portion of the first electrode; and

forming a second electrode (25"') on at least a portion of the dielectric material.

Allowable Subject Matter

Claims 75, 87, and 95 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: the references of record, alone or in combination, fail to disclose or suggest: "the oxidation diffusion barrier comprises at least one of silicon nitride, silicon oxynitride, and aluminum oxide", as required by claims 75, 87 & 95.

Applicant is reminded of rejoinder practice, especially MPEP 821.04(¶2).

Response to Arguments

Applicant's arguments filed 09/29/2006 have been considered but are moot in view of the new grounds of rejection.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 67-95 are rejected on the ground of nonstatutory double patenting over claims 1-26 of U. S. Patent No. 6,534,357 since the claims, if allowed, would improperly extend the "right to exclude" already granted in the patent.

The subject matter claimed in the instant application is fully disclosed in the patent and is covered by the patent since the patent and the application are claiming common subject matter, as follows:

Claim 67 differs from patent claim 1 only in not claiming “removing”.

Claim 68 claims “thermally treating” (patent claim 1).

Claim 69 claims “greater than 300°C” (patent claim 2).

Claim 70 claims “a non-oxidizing atmosphere” (patent claim 3).

Claim 71 claims a metal group (patent claim 4).

Claim 72 claims “platinum” (patent claim 5).

Claim 73 claims a metal group (patent claim 6).

Claim 74 claims “ruthenium” (patent claim 7).

Claim 75 claims a group (patent claim 8).

Claim 76 claims “removing” (patent claim 1).

Claim 77 claims etchings (patent claim 9).

Claim 78 differs from patent claim 10 only in not expressly claiming the portions at which the metal oxide regions are formed are the "grain boundaries".

Claim 79 claims three additional steps (patent claim 11).

Claim 80 claims "greater than 300°C" (patent claim 12).

Claim 81 claims "a non-oxidizing atmosphere" (patent claim 13).

Claim 82 claims etchings (patent claim 14).

Claim 83 claims a metal group (patent claim 15).

Claim 84 claims "platinum" (patent claim 16).

Claim 85 claims a metal group (patent claim 17).

Claim 86 claims "ruthenium" (patent claim 18).

Claim 87 claims a group (patent claim 19).

Claim 88 differs from patent claim 20 in not claiming the "platinum layer having grain boundaries".

Claim 89 claims two additional steps (patent claim 21).

Claim 90 claims "greater than 300°C" (patent claim 22).

Claim 91 claims "a non-oxidizing atmosphere" (patent claim 23).

Claim 92 claims "ruthenium oxide regions" and "unoxidized ruthenium portions" (patent claim 21).

Claim 93 claims etchings (patent claim 24).

Claim 94 claims two additional steps (patent claim 26).

Claim 95 claims a group (patent claim 25).

Furthermore, there is no apparent reason why applicant was prevented from presenting claims corresponding to those of the instant application during prosecution of the application which matured into a patent. See *In re Schneller*, 397 F.2d 350, 158 USPQ 210 (CCPA 1968). See also MPEP § 804.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrew O. Arena whose telephone number is (571) 272-5976. The examiner can normally be reached on M-F 8:30-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Elms can be reached on (571) 272-1869. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Andrew O Arena
9 December 2006

Douglas W. Owens 12/10/06

DOUGLAS W. OWENS
PRIMARY EXAMINER